LIGHTNING RODS!!!

OTIS' PATENT

INSULATED LIGHTNING CONDUCTOR,

THE ONLY METHOD OF

ABSOLUTE PROTECTION AGAINST LIGHTNING,

AS DEMONSTRATED BY SCIENCE AND EXPERIENCE.

FOR SALE

BY THE PROPRIETORS,

LYON MANUFACTURING COMPANY.

OFFICE:

265 BROADWAY, NEW-YORK.

1854.

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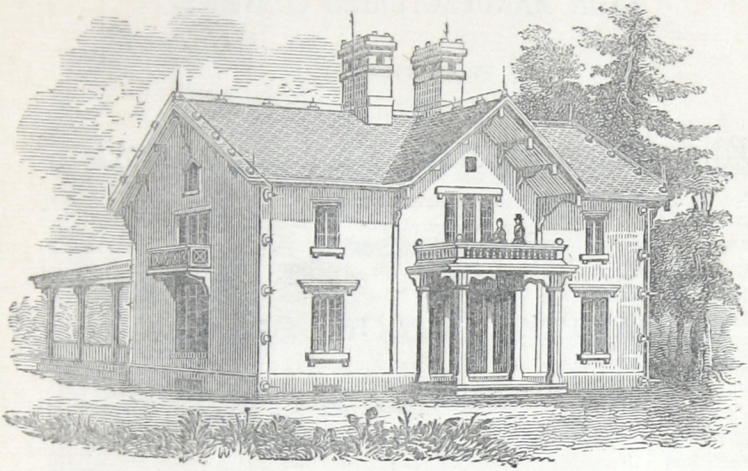

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Otis's Patent Insulated Lightning Conductor.

INCORPORATED NOV. 10, 1853.

CAPITAL STOCK, $75,000.

OFFICERS:

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LIGHTNING CONDUCTORS.

The subject of Lightning Conductors is a branch of practical electricity of exceedingly high interest, and demands the contemplation of the most profound electricians. Hitherto, however, little more has been attended to than the erection of a pointed rod of iron, without regard to situation, altitude, diameter, inferior termination, or any of those theoretical points essential to the efficacy and protection of the conductors, so as to render them a safeguard to persons and property against the most formidable element of nature. It may be stated as a general truth, that all disruptive electrical discharges have one common character,—produce similar effects,—and are governed by the same laws.

If we attentively examine the many recorded instances in which buildings and ships have been damaged by lightning, the course of the discharge may generally be traced; and this course is invariably determined through a given line or lines, which, upon the whole, oppose the least resistance to the neutralization of the electrical forces.

Therefore, nothing is clearer than the deduction, that if buildings and ships were properly provided with electrical conductors throughout, then damage from lightning would be unknown. Thus, discharges of lightning struck repeatedly on the iron steamboat which accompanied Lander on his last attempt to explore the interior of Africa, without producing the slightest effect on it; whilst vessels built of wood and metal were damaged. A man in armor would certainly be safe in a thunderstorm, from the great conducting power of the metal as compared with the human body.

The learned orientalist, Michaelis, states, that the temple at Jerusalem had not, during ten centuries, experienced a single condensed electrical explosion, although from its elevated position, it was exposed to the frequent and terrible storms of Palestine. Now in examining the accounts given of this building, it appears to have been covered inside and out with burnished plates of metal,—Josephus says gold. The top was covered with a thick gilding, and bristled with long pointed iron or steel pikes. The rain from the roof was received into the cistern through metallic pipes. Hence, a more complete system of efficient conductors of lightning, could not have been devised.

A parallel instance is found in the case of the cathedral at Geneva; and still another, the monument near London Bridge.

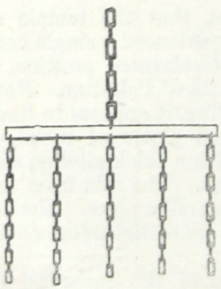
Thus, it is demonstrable by physical facts, that perfect security is guaranteed to buildings and ships having adequate conducting power. Professor Morgan,—a writer well known in certain de-

partments of practical science—proposes the following method as a substitute for the protection afforded by metallic building, viz., "That the foundation of each partition wall should be laid on a strip of lead, or a strip should be fastened to the sides of the partition walls. The strips should be two inches wide, and perfectly connected with each other. A perpendicular strip, on each side of the house, should rise from the conductors to the surface of the ground; whence a strip should be continued round the house, and carefully connected with water pipes, &c. The strips on the sides of the house should then be continued to the roof, which ought to be guarded in the same manner as the foundation. The top should be surrounded by a strip, which should be connected with every edge and prominence, and continued to the summit of each separate chimney."

Such a building would certainly have every requisite for perfect security. But protection no less perfect, and at much less expense, may be secured by having lightning conductors so constructed, as to run the whole length of the building on the ridge, with branches to the chimneys, and duly elevated above them; and, in case of small buildings, continuing the main rod on the ridge over the roof, down the opposite diagonal corners of the building to the ground; and if the building is large, by having rods extend from the main rod on the ridge over each end of the roof, down the four corners; and having all the conductors united to one another by a perfect metallic union.

Professor Sturgeon, Superintendent and Lecturer of the Royal Victoria Gallery of Practical Science, Manchester, formerly Lecturer on Experimental Philosophy at the Hon. East India Company's Military Academy, Addiscombe, &c., &c., &c., says that rods thus constructed form a system of conductors, in which the force of the lightning would be divided, whichever branch was struck. He gives the following beautiful experiment, illustrative of this fact.

"The apparatus represented by the annexed figure, consists of a



series of iron wire chains, so connected as to form a system of conductors of many branches. The chains hang vertically from a horizontal brass wire, and their lower ends rest on a sheet of tin-foil. The single chain first communicates with the inside of the jar, and the tin-foil carries it from the chains to the outside of the jar. The electric fluid, whilst traversing this circuit, illuminates every chain in the system to the same extent, showing that it is equally divided amongst them; and had there been ten thousand such channels, it would have divided itself amongst the whole of them. Such a rod must afford greater electrical capacity than any other construction possible."

The timid may be interested in the following quotation from the *New-York Journal of Commerce.*

"Many persons suffer greatly from fear during thunder storms. In a house protected by rods properly constructed, there is no cause for fear. We knew of a person who formerly, during thunder storms, suffered severely, but after the dwelling had been completely furnished with rods, this suffering was wholly relieved.

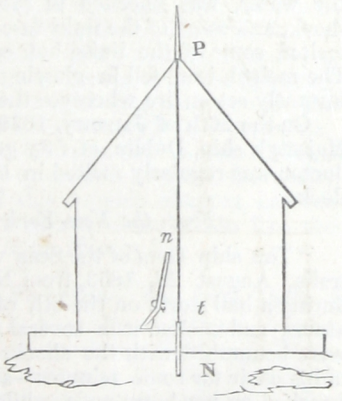
"We have before us a letter from a physician residing among the mountains of New Hampshire, written during the present week; he says that he has met with loss by lightning, and that every thunder storm that passes over his mountain home brings great suffering to his family, and he desired that we would give him directions so that he could put up lightning conductors, and thus provide a remedy.

"Metallic conductors are a protection to a building or vessel against *wind* as well as lightning. Hence the use of the electric kite in France, to disarm the hail storms of their frigidity.

E. MERIAM."

But we affirm, without fear of contradiction, that a safe and durable conductor must have great electrical capacity; otherwise it is liable to be melted, disjointed, and twisted or rent asunder in various ways. Thus, the small conductor of linked brass rod, at Charles' Church, Plymouth, struck by lightning in December, 1824, was literally torn in pieces and disjointed, and many of the links twisted into the shape of the letter S. A part of the wire conductor applied to the Hotel des Invalides, at Paris, was broken into small pieces an inch or more in length, and scattered in all directions, by the lightning which fell on that building in June, 1839. Besides, when the conductor is wanting in electrical capacity, the charge is likely to be divided between the conductor and other lines of transit to the earth or sea.

Arago, in his valuable "*Notices sur le Tonnerre*," published in the *Annuaire* of 1838, has quoted an instructive case of this nature.* It appears that for the protection of a house in the United States of America, a lightning conductor had been applied on the outside of the building, similar to that represented in the annexed figure, in which P is a pointed bar of iron projecting from the roof, N, a similar bar driven into the ground, at P *t* a small brass wire connecting the bar. At the point *n*, inside the house, stood a fowling-piece, *n*, with its barrel against the wall, and separated from the conductor P N only by the thickness of the masonry. The consequence was, that when a discharge of lightning



* Franklin's Works, vol. i. p. 361.

fell on the conductor at P, and passed on the small wire P *t*, it divided at the point *n*, upon the two circuits, and in doing this broke out a large hole in the wall of the house, and shattered the stock of the gun in forcing a passage to the earth. The small wire P *t*, was completely melted so far as the point *n*, but not beyond it; the resistance in the direction P *t* N, at the point of fusion of the wire, evidently exceeded or was equal to the resistance in the direction P *n* N; hence the metal in the fowling-piece evidently saved the remaining portion of the wire *n t*.

Faraday, in speaking of such cases, observes, that all liability to a division of the main charge would decrease in proportion to the capacity of the primary conductor.* Numerous instances of this division of the charge have occurred during the past summer.

The practical question is, "*How can the requisite electrical capacity of a conductor be most effectually as well as most economically secured?*"

1. *The electrical capacity of the rod is promoted by being perfectly continuous*, that is, that the several parts of which the conductor is composed be made to come in as perfect a contact with one another as possible; for electricity finds great obstructions where the conductor is interrupted.

"In ships a chain has often been used for this purpose, which, on account of its pliableness, has been found very convenient, and easy to be managed among the rigging of the vessel; but, as the electricity finds a great obstruction in going through the several links, so that chains have been actually broken by the lightning, their use is now almost entirely laid aside."

The New-York packet was struck by lightning, in the Gulf Stream, in April 1827. The linked iron chain which descended to the water, was knocked in pieces by the expansive force of the shock, and some of the links fused. The flash of lightning not only melted some of the links, but caused them to burn like a taper. The melted iron fell in glowing drops upon the deck, which was instantly set on fire wherever the burning matter fell.

On the 26th of January, 1838, a flash of lightning fell on her Majesty's ship, Dublin, of fifty guns, at Rio de Janeiro. The conductor was regularly melted in several parts, and these fell on the deck.

From the New-York Journal of Commerce.

"The ship Gem of the Seas, which arrived at Melbourne, Australia, August 2d, 1853, from New-York, was struck by lightning during a hail storm on the 8th of July, which shivered the rod to atoms, and melted it in several places. Several of the passengers were benumbed with the shock, and one passenger was transfixed in his chair for some minutes—about the same time the vessel was knocked on her beam ends, while under storm sails.

* Report and Evidence on Shipwreck by Lightning, pp. 34, 35.

"This adds another to our list of vessels with conductors, that have been struck by lightning, in which the conductor was destroyed, but the ship and and its inmates were saved. Had the rod been in one entire piece, it would not have been rent."

In May, 1848, the New Hartford cotton mills were struck with lightning. They were supplied with rods. The superintendent, Geo. Andrews, in a communication on the subject, says—"The rod was round three-quarter inch iron, the ends turned and hooked together, and terminating in moist earth. The fluid left the rod at the lower joint, about fifteen feet from the ground, and passed horizontally through the wall into the room below."

"The Church edifice at Clintonville, Clinton Co., New-York, was struck by lightning and injured, September 20th, 1845. This church was supplied with an iron rod one inch in diameter. The rod was in pieces, at each end of which a turn was made like a hook and eye, to connect the rods together. The lightning damaged the church edifice, broke the doors and window, sand passed through the building the entire length."

Some years since the First Baptist Society of Chelsea, Mass., affixed to their meeting-house a complete set of Dr. King's lightning rods, which, at that time, were connected by a hook joint. Some years after this, the Society raised the spire and enlarged the house, which made an additional length of lightning rod necessary. This additional rod was continuous.

In July, 1847, during a thunder storm, the electric fluid struck the rods and passed off without damaging the building; but in its course it melted every one of the hooked joints, leaving the metal in globules around the hooks, and throwing a clear metallic dust, and also an oxide of the metal on the building, making a very black appearance, like the fusion of powder; but passed over the whole track of the improved rods without leaving the slightest indication of lightning having passed over them. And generally, it has been observed, that when a conductor has any breaks in it, the lightning having struck it, flies from it to some neighboring body, or divides itself between the two in order to pass more rapidly into the earth.

Hence. Prof. Olmstead "respectfully suggests, that our citizens examine their conductors, before they confide to them the safety of their families from the attacks of this terrible element, and see whether the rod is continuous throughout, since breaks like the hook-and-eye joints, greatly impair their efficacy."

New Hoven Palladium, Aug. 26th, 1845.

On May 22, 1848, two dwellings in New Haven, Conn., owned by Messrs. B. & E. L. Atwater, were struck by lightning. Both buildings had lightning rods, terminating at the top in several points, and descending to the ground as low as moisture. The lightning seems to have descended both rods at the same flash. One building—the wooden one, had the edge of the roof torn off

from the ridge to the eaves on the south side. The fluid descended the other building—a brick one, by the rod, until about three feet from the ground; then, instead of going into the earth, stopped, darted directly between the bricks, entered the house, ran along on a brass rod under a pair of sliding doors to the hall, tore off the plaster from top to bottom, and doing much damage in various parts of the building. Prof. Olmstead adds, "there is nothing in these two extraordinary cases, which ought to diminish public confidence in the safety of lightning rods, when constructed according to the rules of science; yet, there is enough to warn us not to trust to badly constructed rods, and not to employ incompetent artists in putting up new ones.

"I am daily more and more impressed with the necessity of a distinct branch of architecture, or civil engineering, devoted exclusively to the arts of warming, ventilation, and protection from lightning. The circumstances of every new house that is built differ so widely from every other, that practical skill and much experience is required in order to render available the principles of science. One who was thoroughly educated in the philosophy of these several subjects (which should imply no small attainments in chemistry and natural philosophy), and then acquire the experience of professional practice, would be able to manage these several objects of ventilation, heating, and lightning rods, vastly better than is now done."

2 Again, *the electrical capacity of the rod is increased by the application of numerous lateral points.*

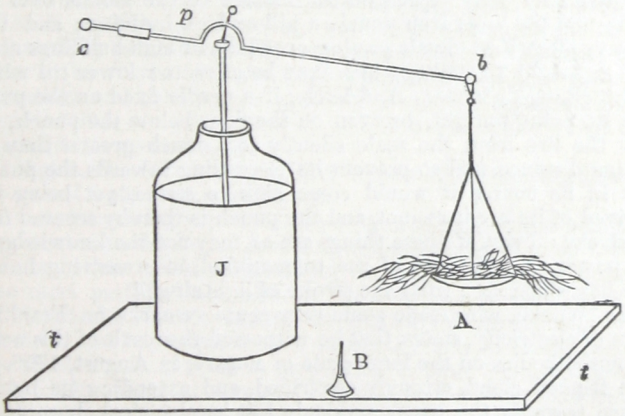
Dr. Franklin observes, "that electricity is not more disposed to leave, or more easily drawn off from any one part of an electrified sphere than from another. But that is not true of any other figure. From a cube it is more easily drawn at the corners than at the plain side, and so from the angles of a body of any other form, and still more easily from the angle that is the most acute.

"Those points will also discharge into the air, when the body is overcharged, without bringing any non-electric near to receive what is thrown off. For the air, though an electric *per se*, yet has always more or less water and other non-electric matters mixed with it; and these attract and receive what is so discharged.

"But points have a property, by which they *draw on* as well as *throw off* the electric fluid at greater distances than blunt bodies can. Thus, a pin held by the head, and the point presented to an electrified body, will draw off its electricity at a foot distance; when, if the head were presented instead of the point, no such effect would follow. To understand this, we may consider, that if a person standing on the floor would draw off the electrical fluid from an electrified body, an iron crow and a blunt knitting-needle held alternately in his hand, and presented for that purpose, do not draw with different forces in proportion to their different masses. For the man, and what he holds in his hand, be it large or small, are

connected with the common mass of unelectrified matter: and the force with which he draws is the same in both cases, it consisting in the different proportion of electricity in the electrified body and that common mass. But the force with which the electrified body body retains its electricity by attracting it, is proportioned to the surface over which the particles are placed; *i. e.* four square inches of that surface retain their electricity with four times the force that one square inch retains its electricity. And as in plucking the hairs from the horse's tail, a degree of strength not sufficient to pull away a handful at once, could yet easily strip hair by hair; so a blunt body presented cannot draw off a number of particles at once, but a pointed one, with no greater force, takes them away easily, particle by particle.

The following experiments show this power of metallic points. I have a large prime conducter, near ten feet long and a foot diameter; which, when charged, will strike at near two inches distance a pretty hard stroke, so as to make one's knuckle ache. Let a person standing on the floor present the point of a needle at twelve or more inches distance from it, and while the needle is so presented, the conductor cannot be charged, the point drawing off the fire as fast as it is thrown on by the electrical globe. Let it be charged, and then present the point at the same distance, and it will suddenly be discharged. In the dark, you may see a light on the point, when the experiment is made. And if the person holding the point stands upon wax, he will be electrified by receiving the fire at that distance. Attempts to draw off the electricity with a blunt body, as



a bolt of iron, round at the end, and smooth (a silversmith's iron punch, inch thick, is what I use), and you must bring it within the distance of three inches before you can do it, and then it is done with a stroke and crack. As the prime conductor hangs loose on

silk lines, when you approach it with the punch iron, it likewise will move towards the punch, being attracted while it is charged; but if, at the same instant, a point be presented as before, it retires again, for the point discharges it. Take a large brass scale, of two or more feet beam. Suspend the beam, so that the bottom of the scale may be about a foot from the floor. Set the iron punch on the end upon the floor, in such a place as that the scale may pass over it in making its circle. Then electrify the scale, by applying the wire of a charged phial to it. As it moves round you see the scale draw nearer to the floor, and tip more when it comes over the punch; and if that be placed at a proper distance, the scale will snap and discharge its fire into it. But if a needle be stuck on the end of the punch, its point upwards, the scale, instead of drawing nigh to the punch and snapping, discharges its fire silently through the point, and rises higher from the punch. Nay, even if the needle be placed upon the floor near the punch, its point upwards, the end of the punch, though so much higher than the needle, will not attract the scale and receive its fire, for the needle will get it and convey it away, before it comes nigh enough for the punch to act.

"Now if the fire of electricity and that of lightning be the same, as I have endeavored to show at large, in a former paper, this prime conductor and this scale may represent electrified clouds. If a conductor of only ten feet long will strike and discharge its fire on the punch at two or three inches distance, an electrified cloud of perhaps 10,000 acres may strike and discharge on the earth at a proportionably greater distance. The horizontal motion of the scales over the floor, may represent the motion of the clouds over the earth; and the erect iron punch, a hill or high building; and then we have electrified clouds passing over hills or high buildings at too great a height to strike, which may be attracted lower till within their striking distance. And lastly, if a needle fixed on the punch with its point upright, or even on the floor below the punch, will draw the fire from the scale silently at a much greater than the striking distance, and so prevent its descending towards the punch; or if in its course it would come nigh to strike, yet being first deprived of its fire it cannot, and the punch is thereby secured from the stroke: I say, if these things are so, may not the knowledge of this power of points be of use to mankind, in preserving houses, churches, ships, &c., from the stroke of lightning?"

Mr. Wilcke, who made some very acute remarks on Franklin's views of electricity, states, that he witnessed the result of this action of pointed bodies on the large scale of nature, in August, 1758. A large fringed cloud, strongly electrified, and extending its inferior surface towards the earth, suddenly lost its electrical character, in passing over a forest of tall fir-trees. The ragged and depending portions shrank back upon the main cloud, and rose up, as it were, from the earth.

When a large jar is fully charged, which would give a violent

shock, put one of your hands in contact with its outside coating, and with the other hand hold a sharp-pointed needle; and keeping the point directed towards the knob of the jar, proceed gradually towards it, until the point of the needle touches the knob. This operation discharges the jar completely, and the operator will either receive no shock at all, or so small a one as can hardly be perceived. The point of the needle, therefore, has silently and gradually drawn all the charge from the inside of the Leyden phial.

If this experiment be performed in the dark, the point of the needle will appear illuminated in its way toward the knob of the phial, which is another proof of its drawing off the charge.

In the year 1839, the Lords Commissioners of the Admiralty appointed a naval commission to investigate the best method of applying lightning conductors to Her Majesty's ships. After a very elaborate inquiry, they drew up a report on this important question, extending to more than eighty folio pages, and containing a valuable mass of oral and documentary evidence, received from naval officers, men of science, and other competent persons. This report was laid on the table of the House of Commons, and in February, 1840, was ordered to be printed.

The naval commission affirm from the instances which were submitted to them of ships without conductors having been struck with lightning, in the presence of ships furnished with them, which were not so struck, that most complete evidence is afforded of the efficacy of pointed conductors in harmlessly and imperceptibly conveying away the electricity to the water.

"It is an observation much in favor of sharp-pointed conductors, that such steeples of churches, and edifices in general, as are terminated by pointed metallic ornaments, have very seldom been known to be struck by lightning; whereas others that have flat terminations and have a great quantity of metal in a manner insulated on the top, are often struck; and it is but seldom that they escape without great damage."

3. Again, *the electrical capacity of a rod may be increased by using a square rod instead of a round one.*

A very interesting report on the subject of lightning conductors, was presented to the Royal Academy of Sciences by M. Gay Lussac. The information contained in it may be regarded in many respects as the most perfect we possess on the subject. In this paper we learn "that the electric matter tends always to spread itself over conductors, and to assume a state of equilibrium in them, and becomes divided among them in proportion to their form, and principally to their extent of surface." Hence, as the same quantity of metal in a square rod presents much more surface than a round one, its electrical capacity is greatly increased. Besides, the edges or corners involve to some extent the principle of points.

4. Again, *a conductor should be insulated.*—The importance of insulating lightning conductors, seems to have been better understood

by electricians, than the methods by which it is effected. Some philosophers observe, that the insulation may be effected by "having the iron fastenings of the rod to the wall large and blunt, and covered with two or three folds of woollen cloth steeped in, and covered with melted pitch;" others, "that the conductor should be fastened to the wall not by iron cramps, but by pieces of wood. If the conductor were quite detached from the building, say they, and supported by wooden posts the distance of one or two feet from the wall, it would be much better." While others, still, have thought that a more perfect insulation was secured by India-rubber, or by passing the rod through the necks of glass bottles, and more recently, through glass thimbles or rings. This latter mode of insulation was for a while very general. But a little experience proved that it was wholly ineffectual. The insulators are broken to pieces the very instant they are most needed. The causes of these glass rings being broken in a lightning discharge, is thus explained by scientific men; viz.: the sudden heat and violent expansion of the air which precedes the electric fluid, and the collapse which immediately follows.

The following instance, reported in the Saybrook Mirror, illustrates the importance of a different mode of insulation:—

"On Friday last, the house of Mr. Wm. Jones, in Saybrook, Ct., was struck by lightning and considerably shattered.

"Upon the building, though small, were two lightning conductors of 'Spratt's patent,'—so far as we could judge, in every respect properly adjusted. Upon one the fluid evidently descended, crushing the glass insulators in its course, and doing no other harm till it came to the sill of the house, and there a part of the charge left the rod and passed to the building, entering it by a nail, around which the boards were blackened as if by the burning of powder. A portion of the sill was entirely removed, and many of the sleepers were shattered. The floor and mopboard were torn off, and the plastering in two of the rooms somewhat injured. Several panes of glass were broken, probably from the expansion of the air occasioned by the heating power of the electric fluid.

"In one of the rooms, the carpet was set on fire, and also the night-clothes of a little child, in the bed from which the child had been removed but a few moments before. Traces of the passage of the fluid were observed in various parts of the house, but we have noticed those which seemed to us the most important. The family, though in the room most affected, were not seriously injured. How were the glass insulators broken? The expansion of the rod could not have burst the insulators, as they fitted about the rod loosely. We think it must have been the violent expansion and subsequent collapse of the air, and the heating of the glass upon the inside of the thimble."

July 27 and 28, at midnight, the Church edifice at Astoria, L. I.,

was struck with lightning and injured. This church was furnished with lightning rods which ran through glass rings.

Last August the house of Mr. Sterling Armstrong, situated in Newark, N. J., was struck by lightning. The results are too well known in almost every part of the United States to require description here. The rods applied were those that run through glass rings.

The first Presbyterian Church in the City of Syracuse, New-York, was struck by lightning. The church had lightning rods attached, but these were improperly fastened to the walls by sharp-pointed staples in full connection with the main rod. The lightning struck the spire, ran down part way, when the charge divided, following a staple fastening into the building, as far as the pointed staple extended. This staple terminating in the dry, hard masonry, which must have been nearly a non-conductor, the charge blasted out a portion of the steeple,—throwing the broken fragments several hundred feet, much after the manner of a too shallow blast in a rock. But the beautiful structure was saved the dire destruction which must have happened had the church been built of wood, a partial conductor when wet, and fastened with iron bolts, &c. These facts were furnished a few months since by several intelligent and respectable citizens of that city, who were eye-witnesses to the accident, each of whom saved pieces that were thus blasted out of the steeple.

From the Journal of Commerce, N. Y.

"A correspondent writes to Mr. E. Meriam from Philadelphia, under date of September 1st, in relation to a house with a lightning conductor being struck by lightning, as follows:—

"'The house is in Franklin township, Clinton county, Pa., occupied by Mr. Thomas Good; it is a two-story brick, with basement cellar at the west end, has been built two years, and the rod put up at the same time, and attached to the walls by iron staples, having hollow pieces of horn in them (through which the rod passed) as insulators; they were all in good order except the lower one downwards from the top, which had got out of the iron staple by some means, leaving the rod bearing against the iron fastening which was driven into the brick wall.

"'The fluid melted about an inch of the platina point, descending the rod to the second iron staple (where the insulator was out). It here followed the staple, penetrating through the wall, and passing along upon the heads of nails upon the floor to the other end of the building, and thence down upon the walls. I have no doubt but the largest portion by far passed down the rod into the earth, and the whole of it would if the insulator had been in its place.'

"This is a very instructive case, and I desire to call the attention of those engaged in putting up lightning rods to the facts stated; for the lightning has in this, as it does in most cases, left an intelligent record, which can be easily read. E. MERIAM."

September 2, 1853.

In June, 1844, the factory of Mr. Effingham L. Capson, situated in the centre village in Uxbridge, was struck by lightning. The fluid struck the rod and followed it down to the basement, where it left and was conveyed into the floor of the weaving room; thence it followed the shaft into the picking room, setting fire to the cotton. The hands were at work in the mill, and one of the weavers had just left her place at the loom where the electric fluid entered and shivered the floor. The rod was an old-fashioned one, secured by staples and blocks, and terminated about eight feet from the building.—*Boston Mer. Jour.*

Saturday, August 9th, 1845, the lightning struck a high brick house, No. 330 Pearl Street, New-York, and did much damage, the particulars of which were given in the New-York Municipal Gazette. The editor calls particular attention to one fact—viz., "the lightning struck upon the granite facing in which a hole had been drilled and subsequently filled with lead. The lightning passed over this lead (it being insulated) to the head of a nail, which nail it followed through the casings of a window in which was a show-case filled with hardware. It passed over this to the opposite end of the case, where it came in contact with a point of a nail, which nail it followed to the head, &c." The editor, who examined and reported this accident himself, truthfully adds—"The nail served the same purpose to lead the lightning into the house, that staples are qualified to do when put around a lightning rod to fasten the rod to the wall of the house. The lightning may follow two prongs of a staple, and thus endanger the inside of the house by these points becoming a conductor into it."

If, therefore, the insulation of lightning conductors is of such primary importance, the method of effecting it is certainly worthy of great care.

Some have erroneously supposed that perfect insulation could not be effected even by glass—that the water which falls upon the insulator renders it a conductor; not appreciating the fact demonstrated by the learned Mr. Cavendish, viz., "that the conducting power of iron to water, is as four hundred millions to unity." Signor Bercaria, a celebrated Italian philosopher, ascertained also, that water in small quantities, was a very imperfect conductor of electricity. Professor Olmstead, of New Haven, Conn., observes, "that if a rod were to terminate at the bottom in a glass bottle, the lightning would not touch it." Hence, the rod in this case must be perfectly insulated, and that too by glass.

5. *Again, conductors should provide for an upward stroke.* Facts are not wanting to indicate the progress of electricity upward. The Marquis Maffei was the first who observed this curious phenomenon. He distinctly saw, during a storm, the lightning issue from the ground with a loud noise. The Abbé Lioni, and M. Segnier, of Nismes, saw the lightning rise in the form of flame six feet high, followed by a loud noise.

On the 24th of February, 1774, lightning struck the steeple of the village of Rouvroi, to the northwest of Arras. A pavement composed of large blue stones, which was laid under the steeple, was violently raised upward.

In the summer of 1787, lightning struck two persons who had taken refuge under a tree near the village of Tacon, in Beaujalois. Their hair was *driven upward and found upon the top of the tree.* A ring of iron which was upon the shoe of one of these persons, was found afterwards *suspended on one of the upper branches.*

On the 29th of August, 1808, lightning struck a small building near the hospital of Salpétriere in Paris. A laborer who was in it was killed, and after the event the pieces of his hat were found incrusted on the ceiling of the room.

When trees have been barked by lightning, it frequently happens that the bark is stripped from the base *upwards* to a certain height, and the upper part of the tree is untouched. This occurred with several trees in the Champs Elysées, at Paris, in a storm which took place in June, 1778.

The leaves of trees which have been struck by lightning often exhibit the effects of heat on their lower surfaces, but not at all on their superior surfaces.

Professor Dewey, D. D., of Rochester University, states that during his connection with Williamstown College, Mass., a church in South Williamstown was struck by lightning. The house was carefully examined by himself after it was struck, when he saw leaves of flowers that had grown by the walls of the church, lodged in the cobwebs up under the eaves.

Some time last summer Mr. Platt's house, Deep River, Conn., was struck by lightning. It was evidently an instance of the "ascending stroke." The front part of the house, including the entire length of the wing attached, was traversed by the lightning, leaving marks of terrific violence wholly unaccountable, unless done by an upward force.

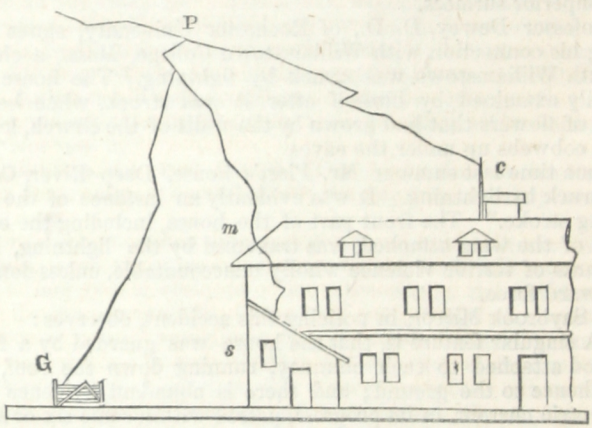
The Saybrook Mirror, in noticing this accident, observes:

"A singular feature is, that the house was guarded by a lightning rod attached to each chimney, running down the roof, and from thence to the ground; and there is abundant evidence that the electric current, in its progress, passed within some six or seven feet of this rod, and that the protection which it is claimed to give, was of no avail in this instance. The rod is known as 'Spratt's Patent,' and was put up by Dr. Minor, who has also put up several in this village, and we would like to hear his explanation of their inefficiency in this case, as he claims them as superior to any other.

"There is sure protection in a conductor, we believe, and it would be well for those about to procure this safeguard, to ascertain that they procure the best article, and have them rightly put up. It is a matter which is not lightly to be passed over, where the lives of people and property are at stake."

6. Again, *a lightning conductor should provide for an oblique discharge.* We find frequent instances, in which lightning avoids the most prominent parts of buildings, and falls obliquely upon some point far removed from them, which may be further adduced as evidence against the attractive influence of such projections. The long zigzag track of lightning, arising from the resistance of the air to its more direct path, may cause it to fall very obliquely on the earth's surface, as is well known: indeed some of the directions of the zigzag, may become almost horizontal. Now, in these cases, the pointed extremities of a tower, or the masts of ships, have no influence whatever on the course of the explosion, which finds its way through the least resisting interval. Mr. Alexander Small states, in a letter to Dr. Franklin, that he saw an explosion of lightning pass before his window in a direction nearly horizontal, and strike a clock-tower far beneath its summit.

The Editors of the Scientific American, July 23, 1853, observe that they "have paid much attention to the direction of the lightning, and have come to the conclusion, that for one vertical flash that reaches the earth, fifty are horizontal, dissipating in the atmosphere like the fibres of a vine spreading out from the main trunk."



In the account given of this case in the *Transactions of the Royal Society*, it appears that an observer who witnessed the descent of the lightning, saw it divide in some point, P, into "three fire-balls, as he termed them. One of these struck in the direction of the conductor at *c*, another damaged the corner of the building at *m*, together with a shed at *s*, and the third struck upon the ground in front of the house, near a gate, at G.

This was evidently an instance of the trifurcation of lightning, one of the divergent branches or streams having fallen on the con-

ductor. But this part of the explosion was discharged safely into the earth, whilst the shed *s*, and corner *m*, which were unprotected, suffered. This case, therefore, affords conclusive evidence of the value of lightning rods. The Committee of the Royal Society, in a report on this circumstance, considered that the rods were not so "perfectly applied as they ought to have been."

No part of the building near them was damaged, and it is not to be expected that they should defend parts at a great distance, especially when such parts are the first exposed to an electrical cloud moving towards them, and likely to strike upon them obliquely.

A church in Connecticut, in which were assembled the congregation, was struck by lightning. Professor Brocklesby, of Trinity College, Hartford, was in the house at the time of the explosion. The spire had a single round rod, running down to the ground. The charge was oblique, and came in a direction opposite to the spire, and struck the end of the church most remote from the steeple.

Professor Sturgeon, above mentioned, remarks, "that a conductor consisting of a single branch only, might be the means of drawing down destruction to some parts of the building before the lightning reached that conductor. For, were the lightning cloud on one side of the building, and the conductor on the other, the lightning would neither go round nor over the house to arrive at the conductor, unless it met with greater resistance in a direct path, and as the destination of lightning is frequently a greater distance from the cloud, and its path considerably oblique, it is possible that some part of its path might be through a part of the building before it arrived at a lightning rod which formed another part of its path.

"Cases of this kind have occurred, and, consequently, may possibly occur again under similar circumstances; therefore it seems to me that unless lightning conductors be properly placed, and of proper materials and dimensions, they may be the means of causing the most destructive consequences to those buildings they were intended to protect. *It is very seldom indeed that a flash of lightning proceeds in a vertical path; perhaps never.*"

"I never yet saw, or heard of, a vertical discharge of lightning; they are frequently very oblique indeed. The lightning which damaged Saint Michael's Church, at Liverpool last year, was an oblique discharge, and struck the bronze cross at the top of the spire, several feet from its top."

It is not easy to assign the limit of the protecting power of a conductor. The French philosophers consider it will afford protection over a circle equal to twice its radius; this, although possible in certain cases, is by no means a general truth. All the experience we have of the operation of conductors on discharges of lightning, tends to the conclusion, that they have no influence whatever in

determining the course of such discharges, further than arises out of the circumstance of their furnishing an easy line of conduction. That they do not always afford protection over any considerable distance, is clear from cases already cited, as well as others which might be adduced.

Nothing is more obvious than that the conductor should be applied immediately to the part to be protected, and not at a distance from it; and should be so applied, that a discharge of lightning falling on the general mass, could not possibly find its way to the ground through the building by any circuit of which the conductor did not form a part; that is to say, the conductor should be so carried over the several parts of the building, that the discharge could not fall upon it without being transmitted safely by the conductor. Hence, the rod should run along the whole length of the ridge, and down to the ground, at least on two sides of the building. If the building is large, it should run down on each corner.

Every conductor running to the ground, should terminate sufficiently beneath the surface, to insure moisture in the dryest part of the season. If circumstances permit, it should connect with a spring of water, a drain, or some other conducting channel.

With regard to the upper termination of a conductor, Professor Lussac, above alluded to, says that "the most advantageous form that can be given to the extremity of a conductor, is that of a sharp cone; and, as iron is very liable to rust by the action of air and moisture, the point of the stem would soon become blunt; and therefore, to prevent it, a portion of the top should be composed of a conical stem of brass or copper, gilt at its extremity; and the higher it is elevated in the air, other circumstances being equal, the more its efficacy will be increased." All electricians agree that it is important to have the head or point acutely tapered and sharp at the extremity. To secure this, the point must not be made of iron or any other metal that will corrode, for a point that will corrode or rust, crumbles off and soon becomes blunt. There have been "Lightning rod pedlers" travelling through the country for the last year or two, who have made a great FLOURISH of TRUMPETS about *magnetized* points. One of these pedlers publishes in his circular the following touching complaint:—"Some persons, in imitation of my patent, profess to put up a magnetic point or points; these are nothing but the ordinary magnets, which can be made out of a tenpenny nail. They possess no power over, or attraction for, electricity whatever; neither can they bear the slightest stroke of lightning." If any "Lightning rod pedler" has discovered that magnetizing a point has any influence whatever upon its power of attracting or capacity for conducting electricity, such a pedler is certainly far in advance of his age; for no one else, however learned and scientific, is aware of any thing of the kind.

In the New Haven Palladium of August 24th, 1845, Professor Olmstead observes that a "Lightning rod acts not by *attracting* the

electric fluid after the manner of a *magnet*, but by conducting it to the earth." Again in Sept. of the same year, the Tontine and several other buildings in New Haven, were struck. The points of the rods on the Tontine—a large hotel—were very rusty. We have on our table a record of over 1500 cases of damage by lightning, occasioning the instant death of many individuals, and the loss of a vast amount of property. Among these, we have many sad illustrations of rods being improperly constructed and unwisely applied. In addition to the instances already mentioned, we could add scores of failures of rods of the following construction, viz.:—First, those rods which are linked together by a hook and eye—second, those fastened up to the buildings by iron staples, and lastly, those rods fictitiously insulated by running through glass rings with "*magnetized points*" so called, at their upper extremity.

Within the last twelve months we have had occasion to examine the writings of every author on the subject of practical electricity, that we could find in the libraries of New-York and other cities. We have also had much experience in the laboratory, and feel prepared to demonstrate by experiment and by an appeal to facts, that the views set forth in these few pages, are not only theoretically true, but practically so.

Those interested in examining for themselves, we would refer to an English work, by S. W. Harris, on Thunderstorms, or a Treatise on Lightning Conductors, recently published in New-York by G. P. Putnam, 10 Park Place. The latter is the only work of the kind published in this country. Price 75 cents.

And now the question arises, what lightning conductor, in the light of electrical science, offers the most perfect protection against lightning. Every man, of course, will be his own judge. There are several kinds of lightning rods, and each proprietor is supposed to lay claim to superior merit. In offering Otis's Patent Insulated Lightning Conductor to the public, we only ask for it a careful examination. It was patented Aug. 26th, 1851, and has been extensively used in the different sections of the U. S., Canada, West India Islands, &c. &c. It has been repeatedly struck with lightning, after which a careful scientific survey has been made, and we are happy to state that the slightest harm has never happened either to the rod or the building to which it has been applied. It has been submitted to the critical examination of the most eminently scientific men of our country, and uniformly pronounced the most perfect protection against lightning.

The frontispiece will give an idea of the leading features of Otis's Patent Insulated Lightning Conductor, and the mode of attaching it to buildings. The entire rod is as perfectly INSULATED as the telegraphic wires, and passing over or upon the insulators and not through them, no harm can possibly occur *to the* insulators by an electrical discharge. This fact, both the principles of electrical science, and the experience of several years, have fully demon-

strated. This rod is also perfectly continuous, having no hooks or breaks in its whole track to the earth. It has sharp points every six feet wherever the rod runs, each of which is as good a discharging or receiving point as the one at the upper extremity. Thus providing for an oblique discharge as well as trebling the electrical capacity of the rod. At each chimney and prominent elevation, the rod is terminated with an acutely tapered point or branched head, wholly protected from corrosion by a heavy, *fire gilt*, gold plate, and at both ends of the ridge and each corner of the roof are placed plated metallic points, two feet in length.

The rod, also, provides for an upward stroke, by having points terminating deep in the earth on either side of the building, and numerous discharging points over the different parts of the building protected.

Less protection may possibly answer for small buildings, but not for large ones. However, the purchaser must be his own judge. Even a single rod (which by the way is inadequate for any building) will afford greater protection by far, than can be furnished by the same number of feet of any other rod.

The premium has been awarded this conductor at the Connecticut State Fair, Hartford; at the Middlesex Mechanics' Fair, in Lowell, Massachusetts; at the Hampden County Fair, Springfield, Massachussetts; at the Hampshire County Fair, Amherst, Massachusetts; at the State Fair in Michigan, and also, the premium a second time was awarded this conductor at the Connecticut State Fair, Hartford; and generally we may *truthfully affirm*, that, *whenever* and *wherever* Otis' Patent Insulated Lightning Conductor has been on exhibition, in comparison with any, or every other rod, it has never failed to win for it an unqualified preference. We might add, also, several hundred testimonials of the following import:

From Prof. Brocklesby, Prof. Mathematics and Natural Philosophy, Trinity College, Hartford.

I have carefully examined the Patent Insulated Rod of Mr. Otis, and cheerfully bear my testimony to its excellence. It is constructed and erected according to scientific principles, and the electrical conditions by which protection from lightning is secured, are better met and complied with by this rod than by any that I have seen. The numerous points that bristle upon it, tend to prevent a violent explosion, either direct or lateral, and cause a rapid but *silent* discharge of the electric fluid between the clouds and the earth. This noiseless dissipation of the fluid is also facilitated by the shape of the rod; a *square rod* being better in this respect than a *round* one, on account of its *sharp edges;* and the same end is answered by the points that project from the rod beneath the surface of the ground.

This rod is *perfectly continuous;* for when the several parts are screwed together, metal joins with metal throughout its entire length—a condition of such importance that if unfulfilled, a rod is useless.

It is worthy of remark that this rod is so constructed, that if erected at all, it is *properly erected*, so far as this *perfect continuity* is concerned; for the veriest novice, by merely putting the parts together, makes a perfectly continuous rod.

The rod is well insulated, very little metal being employed in the fastenings. The upper points of it, like those of some others now in use, are gilded to prevent corrosion; but it possesses this advantage, that the branched head, if injured by the elements or otherwise, can be replaced by a new one, without removing the rod itself. I should consider a building furnished with the rod of Mr. Otis, erected in the manner Mr. Otis intends that it should be, as more effectually secured from lightning than by any other means with which I am acquainted.

JOHN BROCKLESBY.

From Hon. Henry Barnard, LL. D., Superintendent of Common Schools in Connecticut.

Wishing to protect a dwelling-house, recently erected by me, so far as practicable, from the disastrous effects of lightning, I examined several of the best rods in use in this neighborhood, and gave the preference to Otis's Patent Insulated Conductor, as altogether the best devised, the most perfectly insulated, more neatly and permanently attached to the building, and the most economical; and I have had the same put up to my entire satisfaction.

HENRY BARNARD.

From Prof. Conant, D. D.

Some months since, I caused the Patent Insulated Rod of Mr. Otis to be attached to my dwelling-house in this city. My attention has often been directed to the best method of constructing and insulating Lightning Conductors, for the protection of buildings. I have selected this rod, after carefully examining its peculiarities, from the conviction that it is the most perfect one now in use.

T. J. CONANT,
University of Rochester.

Rochester, December 15, 1852.

From Messrs. Lyon and Frieze, Principals of the University Grammar School.

This may certify that the subscribers, after carefully examining the most approved modes of protecting buildings from the destructive action of electric fluid, give a decided preference to the rod with insulated supporters and points, the invention of Mr. Otis, and have contracted to have it placed upon their School-house.

The usual adjustment connects the rod with the building by iron staples, and lessens the conducting surface where the parts are united; while this, by separating the entire rod from the building by glass insulators, affording an ample and continuous surface for the passage of electricity, conforms to the well established laws of that subtle agent.

The arrangement is simple and complete, and we commend it to the notice of all who are interested in improvements calculated to secure life and property.

MERRICK LYON,
HENRY S. FRIEZE.

Providence, February 9th, 1853.

From J. S. Bacon, D. D., President of Columbia College, D. C.

SIR,—I have carefully examined the Lightning Rod which you left with me, and have received a very favorable impression of its qualities. It appears to be constructed upon thoroughly scientific principles, and I should judge, is better adapted to its object than any one I have seen. The method of insulation is certainly ingenious, and it must be very effective. The number of points it presents, including those at the joints and fastenings—the method of securing these against oxidation—together with the size and shape of the rod, all seem to me to be excellent qualities, which give it an advantage over any that I have noticed. I should feel entire confidence in the protection it would afford to buildings to which it is properly attached, and it would give me pleasure to see it brought into general use.

I am, very respectfully, yours,
J. S. BACON.

To George W. Otis, Esq., Lynn, Mass.

From A. Caswell, LL. D., Prof. of Natural History, Brown University, Providence, R. I.

I have examined the construction of the Patent Insulated Lightning Rod, of G. W. Otis, and have no hesitation in saying that it appears constructed on sound scientific principles, and offers as fair a promise of protection against injury by lightning as any other which has fallen under my notice. The modes of insulation and joining, the rods, are well devised. The multiplicity of points at the top has this advantage, that they will not all be likely to be fused and blunted at the same time.

A. CASWELL.

From Prof. Hutton, Principal of Deaf and Dumb Institution.

Lyon Manufacturing Co.

GENTLEMEN—The Lightning Rod which it is your design to introduce into this State, seems to possess every requisite for a perfect conductor. The insulation is complete. The mass of metal is sufficient to conduct an immense quantity of electricity. The points are sufficiently numerous to give off all the fluid returning from the earth to the clouds. Your rod is durable, ornamental in appearance, and of moderate expense. With all those valuable qualities, I hope it may be extensively introduced, and prove the means of saving many lives and much property.

A. B. HUTTON.

Philadelphia, Pa., May 27th, 1853.

From Rev. William G. Howard, A. M.

I have examined, with some care, the Patent Insulated Lightning Rod of Mr. Otis, and am fully convinced that it combines more excellencies than any conductor now in use. The arrangement of the rod and points, in which it differs from all others, renders it the cheapest, safest, and most economical rod for the purpose intended.

WM. G. HOWARD.

Rochester, N. Y., June 8, 1852.

From Prof. West, LL. D., Principal of Buffalo Female Academy.

From a careful examination of Mr. Otis's Patent Insulated Lightning conductor, I can recommend it as embodying all the requisites of a safe and economical arrangement for the protection of buildings against electric fluid.

The rod is of square split iron, with points at short intervals to dissipate into the atmosphere any excess of electricity which, from incapacity of the rod, might not be disposed of at either extremity of the same. This is a peculiarity of Quimby's rod. It differs from Quimby's in being insulated, or, in other words, in having no electrical connection with the building to which it is attached. This is done by means of glass caps.

Here an objection has been raised, because of the impossibility of preventing the caps from being moistened by the rain, thereby destroying their insulation. This would be a valid objection, were the conducting power of water the same, or nearly the same, as that of iron. But this is far otherwise; for, according to Cavendish, their ratio is as unity to millions.

It would therefore appear to be of little moment whether the caps be wet or dry, provided the electric connection with the earth be perfect

The lower end of the rod above described, is divided into two parts, while the upper end is crowned with several gilded points. The object of this is to make as perfect a connection between the earth and clouds as possible. Every prominent point of the building protected, as chimneys, &c., is armed with such a road, and all these are connected together.

These are some of the points of excellence of this rod, which are sufficient to entitle it to general use in the community.

J. H. WEST.

Buffalo Female Academy, June 30, 1852.

From Prof. J. V. C. Smith, M. D., Boston.

Having examined the Insulated Lightning Conductor, invented and patented by G. W. Otis, of Lynn, Mass., I have no hesitation in recommending it to the public, as an admirable, economical contrivance, that promises to be of great utility.

J. V. C. SMITH.

Boston, October 22, 1851.

From the Lynn News.

A safer, a more beautiful or scientific conductor cannot be conceived than the one recently invented and patented by Mr. G. W. Otis, of this city. It is constructed of the best rough split soft iron, with an elegant rhomboidal head of yellow metal, gilt by the electrotype process, thereby excluding oil, glue, varnish, or other non-conductors. It is as nearly perfectly insulated from the house as it can be made, by fastenings of glass, in which the pointed staple is cemented, and the whole embedded in a neatly turned wooden foot, which is to be fastened to the house.—Mr. Otis can safely insure the life, limb and property, that enjoy the protection of this admirable conductor.

From Hon. George Hood, Mayor of Lynn.

Desiring to have a Lightning Conductor put upon my dwelling-house, I examined the different kinds, and was fully satisfied that Mr. Otis's Patent Insulated Conductor was the best, safest and most economical article which has been invented for this purpose. He has put one upon my house, in a very thorough and perfect manner, and at a very moderate expense. I consider his improvements, especially the insulation of the rod from the building, by non-conducting glass caps, just what was needed to secure and protect buildings from the effects of electricity; and take pleasure in recommending it as worthy of the confidence and patronage of the public.

GEORGE HOOD.

Lynn, July 22, 1851.

From Prof. Batchelder, Jr., Principal of the High School in Lynn.

I have examined with pleasure this truly scientific arrangement of rods and points for the protection of buildings from electricity, and without hesitation pronounce it to be the safest and most economical apparatus for the purpose designed that has ever been presented for my examination.

1. It is buried in the earth deep enough to meet the moisture, and conveys to or from the earth the electricity by two points.
2. It is fastened securely by nuts to glass caps embedded in a neat wooden pedestal, whereby the rod is entirely insulated from the building.
3. The rod is made of the best quality of split iron.
4. At the distance of every six feet, a receiving point or nut is presented to the electrical atmosphere.
5. The rod is neatly terminated with an electro-gold-plated head or point.

In short the Patent Insulated Conductor leaves no room for improvement, whether protection is sought from the direct or returning stroke.

The object of the inventor has been to prevent the electric stroke from reaching the building, by presenting to it above and beneath

the surface of the earth, points of attraction, sufficiently prominent and numerous to receive and dissipate the electric current.

Every building of much value should be protected from the electric fluid; and nothing can excel the beautiful conductors offered by Mr. Otis to the public.

JACOB BATCHELDER, Jr.

Lynn, April 1, 1852.

From the Boston Evening Traveller.

We have lately had our attention called to Otis's Patented Insulated Conductor for buildings and vessels, and must acknowledge that we are more pleased with it than with any other conductor that has fallen under our notice. With the recent total loss of the magnificent clipper "Golden Light" fresh in our minds—burnt at sea from the effects of a stroke of lightning, together with the disastrous effects of lightning to buildings and life on shore, accounts of which we read in almost every daily journal—it strikes us as singular that more attention is not paid to averting this dreadful visitation of nature, by the use of a safe conductor. Since Dr. Franklin first put lightning into harness, quite a number of conductors have been constructed on different principles, and used with varied success, but this one is vastly superior to all that have preceded it, in its perfect insulation from the building or vessel, and its peculiar form and connection. It needs but to be known and seen to be appreciated, and the inventor will no doubt reap a rich reward for his labors.

From the Scientific American.

We have before us a model of the lightning conductor of G. W. Otis, of Lynn, Mass., for which a patent was granted on the 26th August, 1851, and which is now owned by the Lyon Manufacturing Company, of this city (Mr. Lyon is the author of a treatise on lightning conductors recently published by Putnam); it is a good and certain conductor. The main rod is of iron, square in form, and made into sections screwed into one another, in metal eyes, secured to the binding insulators, which are glass cylinders secured to dry wooden collars that bind them to the building. Each binder terminates in a horizontal point at its extremity; the upper parts of the conductor are composed of many points branching off, and all tipped with gold. The insulation is perfect, and the rod is more nearly continuous than if it were formed in link sections.

From J. N. Loomis, formerly Professor of Natural Science in Franklin College, near Nashville, Tenn., at present Professor of Chemistry and Natural History in the Medical College at Macon, Ga.

Having for the last eight years given considerable attention to the various departments of electrical science, and having examined many lightning conductors North and South, I have no hesitancy in

pronouncing Otis's Patent Insulated Lightning Conductor, as embodying more of the necessary scientific principles and of the conditions of certain protection, than any now in use in this country.

The elegant and perfect method of insulation, constitutes its chief excellence, while it combines all the advantages of Quimby's and other rods. When the rod passes through glass rings, which are supported by metallic iron bolts driven into the walls of the house, as in the old method, the glass ring is easily broken—1st, from being interposed between two metallic surfaces; 2d, by the condensation of the atmosphere before an electrical current; 3d, by the violent collapse of the air which immediately follows; and 4th, by the heat of the electrical discharge, like the pouring of hot water into a glass tumbler. The insulators being thus broken, the electrical fluid is even *invited* to the building. Many houses with this imperfect protection have been destroyed by lightning. But a few days since I saw a small house struck though protected by two such rods.

I regard the inventor of this *new conductor* as a benefactor of mankind, in having furnished the world with so certain a protection to life and property, against the most terrific agent.

J. N. LOOMIS.

Intelligent local agents are being appointed in every town and county in the United States, to avoid the impositions of irresponsible lightning-rod peddlers, whose flagrant misrepresentations have defrauded thousands in different parts of our land, besides increasing the exposure of their families and property to the fury of the lightning blast. Those local agents are sought, who are supposed to be well known in the neighborhood in which they reside, and hence incompetent to deceive. Besides, these agents are provided with a complete treatise on lightning conductors, explaining the principles involved in the protection of buildings from lightning. This authentic work is published by G. P. Putnam, No. 10, Park Place, and is the only work of the kind published in this country. Persons wishing to protect their buildings, will find it for their interest to call on these local agents.

As our method of applying conductors to ships is novel, and as we have facilities for furnishing a better protection than has been afforded by any other man, either in this or foreign countries, we beg leave to call attention to this particular branch of our business. The importance of the subject will appear from the following, copied from the New-York Journal of Commerce. The communication was furnished by Professor E. Meriam, who has a more perfect record of disasters by lightning than any other man living.

"The loss of the ship Golden Light by lightning on the night of 22d of February ult., and the probable loss of the lives of twenty persons, add another to the melancholy record of the loss of life and the loss of vessels at sea, by the neglect to put up lightning con-

ductors. The Boston Insurance Companies will be taxed heavily for the neglect in this case, as the ship and cargo are valued at three hundred thousand dollars. On the 4th of March, 1850, the brig Lincoln, bound from Boston to California, with a valuable cargo, was struck by lightning, set on fire, and consumed; but before the vessel was wrapt in flames the German ship Maria Christiana, Capt. Vass, providentially hove in sight, and rescued the officers and crew. In this case the Boston insurance Companies paid a large sum as a penalty for neglect to require the use of lightning conductors.

We have never known a claim to be made upon Underwriters for loss or damage by lightning, to vessels or cargo, in any case where the lightning conductors were up.

When last at Washington, we called on Commodore Shubrick, Chief of the Bureau of Construction, to inquire if any case of loss or damage by lightning had been experienced by our public armed ships furnished with metallic conductors—he replied, that no loss or damage by lightning in such cases had been known, and that the commanders of vessels were strictly required to report all cases of damage by lightning.

Our record of lightning disasters presents the following list of vessels burnt by lightning:

1830, ship Boston and cargo, at sea.
1840, May 16, ship Poland, at sea.
1845, Nov. 25, bark Bayfield, freighted with spirits and gunpowder, at sea.
1846, Sept. 17, brig Oscar, at Port of Spain.
" Nov. 29, ship Thomas P. Cope and cargo, at sea.
1847, Feb. 11, ship Christophe Colombo, 75 miles from Havana.
1847, Dec. 6, ship Robert G. Shaw, at sea.
1848, April 18, brig Rebecca C. Fisher and cargo, off the Highlands of Nevesink.
1850, March 4, brig Lincoln and cargo, at sea.

The following is an account of vessels sunk by lightning:

1847, June 14, British ship Columbia, off Cape Henry.
1848, July 1, pilot-boat Four Sisters, of Sand's Point.
1848, July 29, flatboat, loaded with coal, while descending the Mississippi; all on board perished.

The ship Boston, ship Robert G. Shaw, bark Lincoln, and clipper ship Golden Light, were all Boston vessels.

On the 2d of July, 1846, the brig Columbia was struck by lightning, while off the Balize, and all on board except the captain were thrown into the sea and lost.

We have never known of a case of loss of life by lightning in a vessel or building furnished with lightning conductors, nor have we ever heard of an iron ship being struck by lightning, or of loss of life by lightning in a vessel or boat propelled by steam;

nor have we been able to hear of a single instance in which the guns, chain cables, and anchors on board of ships of war have diverted the lightning from the lightning conductor.

These facts we deem a sufficient answer to the suggestions often made, that lightning rods are dangerous because they attract the lightning.

Our lightning record, of 1851 and 1852 are not yet posted up; they contain one record at least, of a vessel, near Mobile, struck by lightning and set on fire; the vessel was scuttled to prevent it from burning.

Will not Underwriters encourage captains of vessels to use lightning conductors, by allowing a discount in the premium of insurance to such are provided with them?

Since the above statement, the Board of Underwriters have made a law or an agreement, to allow a discount of two and a half per cent. in the premium of insurance on such vessels as are provided with lightning conductors. Those interested in examining our *new method of rodding ships*, will find themselves amply rewarded.

Any person desiring a local agency—or an agency to travel and appoint *local* agents, will please apply to the

LYON MANUFACTURING CO.,
Proprietors of Otis's Patent Insulated Lightning Conductor.
Office, No. 265 Broadway, New-York.

WHEELER & WILSON'S MANUF'G CO.'S

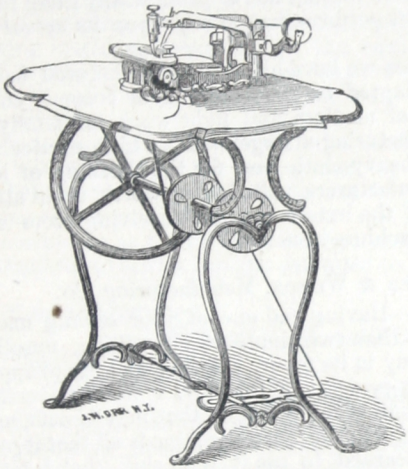
SEWING MACHINES,

MANUFACTURED AT WATERTOWN, CONNECTICUT.

OFFICE, 265 BROADWAY, NEW-YORK.

A. B. WILSON'S PATENT,

PATENTED AUGUST 12, 1851.



AND JUNE 15, 1852.

AGENCIES AT

63 COURT STREET, BOSTON.
172 CHESNUT STREET, PHILADELPHIA.
IRON HALL, WASHINGTON.

As the fact is now well established that sewing machines are destined to do a greater portion of the work heretofore done by the needle, it becomes a matter of the first importance to the public, to ascertain which of the many kinds thrown upon their credulity will *practically* and *fully* do all that is so freely and strongly promised by their proprietors and their numerous agents scattered through the country.

The proprietors of the Wheeler & Wilson Manufacturing Co's. machine, have been willing to submit it to the most *searching practical test;* and the result has, in every case, been of the most satisfactory kind, not only to themselves in the sale of their machines, but to their numerous customers, who invariably give their testimony in favor of the quality of the work, the great rapidity with which it can be done, and the ease with which they can be kept, in the most perfect order the machine which will do the work the most rapidly, and at the same time the most perfectly, is the cheapest, without regard to price, for no manufacturer or sewer can successfully meet the competition in the market, without securing to themselves the very best facilities for doing the work in the quickest and most satisfactory manner.

It is our determination not to promise any thing for our machine which it will not perform, but to rely upon its *actual merits* for its success.

The machines we have hitherto manufactured have been more particularly adapted to the stitching of bosoms, collars, and the various kinds of medium and light work for family use; but we are now manufacturing a larger size, which particularly excels in the sewing of heavy cloth and for the stitching of leather. Boot and Shoe manufacturers will find it worth their attention. We submit a few of the letters we are receiving from our customers having these machines in use.

Messrs. Wheeler & Wilson, Manufacturing Co.

Gentlemen—Having had one of your sewing machines in my family for more than two months, I am willing, unsolicited, to give you my testimony in its favor. Adverse as I am to append my name to the ordinary projects of the day, I wish, nevertheless, to say something through such a medium that may benefit my sex.

In the first place then, your machine is all that it purports to be. I have myself learned to use it with skill, that I may pronounce understandingly upon its merits.

I have never had a needle broken in its use, nor has it in the least become disordered; notwithstanding that I have allowed several persons to learn upon it, and all kinds of household work has been executed thereon; indeed fine muslins and heavy broadcloths have tested not only its delicacy but strength also.

Secondly, the work does not *rip*, and every housekeeper can appreciate that quality. The work is what is called stitching, and I find it much more elegant than a common hem for all needle purposes. It gives handsome finish to the tucks and hems of skirts, while in shirt-making no work done by the hand can compare with that executed upon the sewing machine.

No woman's eyes or fingers can execute work with an equal precision and finish.

Thirdly, it is a vast saving, not only of nerves and patience, but

of time also. The machine is equal to the labor of nine or ten persons. One individual can sit profitably at the machine, and do that proportion of the work.

Now these are facts which I wish to present to the heads of families. I wish to see the petty toil of my sex lessened whenever it can legitimately be done. I find the sewing machine does this in one very essential branch of home industry, and, therefore, I wish to urge upon families and neighborhoods, to combine together and procure an instrument calculated so much to alleviate household toil.

If our brothers ply any vocation of thrift or necessity, they are careful to procure the best tools. They do not hesitate to expend hundreds and thousands for the purchase of all sorts of "labor-saving machines" to lighten their own burdens.

Now, will they not carry the principle further, and by the purchase of the sewing machine, lessen the toil, the anxieties and the wear and tear of nerves to their wives and daughters? I do not say this to sell your machines, gentlemen, but I say it because I sympathize with my sex.

I know how wearisome is the bondage of the needle to woman, and I seize upon this invention of the sewing machine as one of the best means of relief the age affords us. I do not know that it is even second to the cotton-gin.

I look upon machinery as the great emancipator of the world, and am doubly thankful to see its benefits extended to the relief of us—our sex.

Very respectfully,

(Signed,) E. OAKES SMITH.

Brooklyn, L. I., December 9th, 1853.

Rochester, December 8th, 1853.

Since May last, we have had one of "A. B. Wilson's Improved Patent Stitching Machines" in constant operation on woollen goods. We are making plain and fancy cassimeres and satinett pants, and the machine is well adapted to our work.

We also have two of them running on satin vests, and the stitching is much nicer than any of our hand-made work. All the work done with the machine looks uniform, sells readily and gives satisfaction; our wholesale customers prefer it to hand-work.

GREENTREE & WILL.

Rochester, December 9th, 1853.

We have three of "A. B. Wilson's Improved Stitching Machines" now at work for us and find them to be well adapted to our business.

We are running them on various kinds of woollen goods, from fine doeskin cassimeres to coarse satinett. We consider them peculiarly suited to our finest qualities of work. The stitching is uniform and strong—the goods sell readily and give perfect satisfac-

tion. Most of our wholesale customers prefer the machine made, to the best of hand-work, from the fact that it is really better.

ALTMAN & STETTHEIMER.

New Haven, February 7th, 1853.

GENTLEMEN—Your favor of 20th January was duly received, but my absence from home has prevented an earlier answer.

In reply to your inquiries, would say that my attention has been turned to the subject of sewing machines some ten or twelve years, with the object of finding something that would work well on fine linen and cotton.

Many machines have attracted my notice and examination; the first of which was on exhibition at the National Fair in Washington, in May, 1846, by Elias Howe, I think. Since that, among others were Bradshaw's & Martin's of Lowell; Morey & Johnson, Derow & Blodget, Grover & Baker's of Boston; I. M. Singer's of New-York, and later still, one by Doct. Avery to sew with two straight needles. All of them have been examined carefully, and several of them thoroughly tested on linen. First, Morey & Johnson's, and lastly, I. M. Singer's, with whom a contract was made for thirty machines, a certain number to be "adapted to sewing on fine linen." After several months of fruitless efforts, the machines were abandoned at a loss of between three and four thousand dollars.

Since then we have taken hold of your new machine, "Wilson's Stitching Machine," and it gives me pleasure to say we have met immediate and profitable success in its use, and are confident it must come into general use among manufacturers of linen; and we are fully satisfied, from long and dear experience, that there is no other machine that is applicable to sewing on fine linen.

Respectfully yours,

O. F. WINCHESTER.

N. B.—Mr. W. (the author of the above) has now in operation between 40 and 50 of our machines.

East-Brookfield, December 4th, 1853.

Messrs. WHEELER & WILSON, Manufacturing Co.

GENTLEMEN—I have two of your stitching machines in operation, and consider that they are capable of executing the work more neatly and durably than any other machine I have seen, and with double the dispatch. I can stitch thirty dozen collars in a day, with ease, and have stitched as many as fifty-five dozen in a day. I have also stitched 240 dozen in six days; have stitched six and a half dozen bosoms with seven rows stitching in one day; have done the machine work of fifteen dozen skirt trimmings in four days, where there were nine rows of stitching in a bosom.

I shall be happy to prove the capacity of the machines to any one who will call at 63 Court Street, Boston.

Respectfully yours,

LUCINDA A. STEVENS.

Troy, December 16th, 1853.

Messrs. WHEELER & WILSON, Manufacturing Co.

GENTLEMEN—We have in use ten of your sewing machines, which give us entire satisfaction: the work done by these machines is correct, neat and substantial, and much more desirable than that done by hand. The machines from their first introduction into our business, have been a source of profit, and we believe them to be the only machines adapted to the stitching of linen.

Respectfully yours,
MAULIN & BLANCHARD.

Philadelphia, December 8th, 1853.

GENTLEMEN—It is almost a year since we commenced using the Wheeler & Wilson Manufacturing Co's sewing machine, for stitching linens.

And during that time we have had five machines in successful operation, and in no instance have they been repaired: but independent of their great durability and simplicity of management, the superiority of work to that done by other sewing machines (of which we tried several others unsuccessfully) cannot fail to commend them to the public.

Yours respectfully,
M. & S. STERNBERGER,
Keystone Shirt and Collar Manufacturers.

New-York, December 21st, 1853.

Messrs. WHEELER & WILSON, Manufacturing Co.

GENTLEMEN—We have had in use constantly twelve of your sewing machines for nearly a year.

The operation of the machine is so simple, easy, and rapid, together with the quality of its work—being superior to hand stitching or sewing—that the use of it has given us entire satisfaction, and we believe it to be the only machine (as far as we have investigated) capable of stitching on fine linen.

Yours respectfully,
G. A. TROWBRIDGE & CO.

WHEELER & WILSON MANUFACTURING COMPANY'S

SEWING MACHINE,

MANUFACTURED AT WATERTOWN, CONN.

OFFICE, 265 BROADWAY, NEW-YORK.

A. B. WILSON'S PATENT

(August 12, 1851,)

AND JUNE 15, 1852.

AGENCIES AT

63 COURT STREET, BOSTON.

172 CHESNUT STREET, PHILADELPHIA.

IRON HALL, WASHINGTON.

These Machines have been in successful operation, in the hands of manufacturers and families, for the past two years, and in every case have given universal satisfaction. The Proprietors are now prepared to offer them to the public, with that increased confidence in their merits which the united testimony of their numerous customers has strengthened and confirmed.

These Machines are entirely different from any other, the principles on which they are made being *exclusively* our own.

Among the advantages of this Machine over any others are the following:—

1. The simplicity of its construction, and the ease with which it can be kept in the most perfect order.

2. The perfect manner with which the operator is enabled to stitch and sew the various kinds of work, from the finest linen to the coarsest cloths.

3. It particularly excels in the rapidity with which work can be executed; in that respect it has no equal.

4. The little *power* required to propel them, enabling even those of the most delicate constitution to use them without injury to their health.

We are now manufacturing a larger sized Machine, more particularly adapted to the sewing of leather, canvas bags, and the heavier kinds of cloths.

An examination of our Machines is respectfully solicited at our Office, 265 Broadway.